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| EXAMINER |
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ARTMAN, THOMAS R

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| ART UNIT | PAPER NUMBER |
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2882

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05/09/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/538,525

Applicant(s)

HARDING, GEOFFREY

Examiner

Thomas R. Artman

Art Unit

2882

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 17 April 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-15 and 17-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-15 and 17-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 10 June 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- 1) ☒ Certified copies of the priority documents have been received.
 - 2) ☐ Certified copies of the priority documents have been received in Application No. _____.
 - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 3-9, 11-15 and 17-19 are rejected under 35 U.S.C. 102(b) as being anticipated by Arndt (US 6,282,263 B1).

Regarding claims 1, 14 and 15, Arndt discloses an X-ray source (Figs.1 and 2), including:

- a) an electron source 3 for the emission of electrons, and
- b) a target 4 for the mission of characteristic, substantially monochromatic X-rays in response to the incidence of the electrons, where the target is a metal foil less than 10 μm (col.6, lines 13-14), and
- c) a base arrangement for carrying the metal foil, where the metal foil has a high atomic number (copper) allowing the generation of X-rays and the material substantially included in the base arrangement has a low atomic number (carbon) not allowing the generation of X-rays (col.6, lines 5-18), the source further having
- d) an outcoupling means 6 for outcoupling the X-rays on the side of the metal foil on which the electrons are incident and which is opposite to the side of the base arrangement (Fig.2).

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With respect to claims 3-5 and 17, Arndt further discloses that the base arrangement has a cooling circuit (items 15-17) arranged to allow water (having a mean atomic number less than 10) to flow along the side of the metal foil opposite to the side on which the electrons are incident (Fig.2; col.4, lines 31-34 and 37-38).

With respect to claims 6 and 18, Arndt further discloses that the cooling circuit has a constriction in the area of the metal foil (at outlet of tube 15 and the back of the target 4, Fig.2).

With respect to claims 7 and 19, Arndt further discloses that the target carrier has a low atomic number material having a mean atomic number less than 10 (carbon) on the side facing the coolant (col.6, lines 5-18).

With respect to claim 8, Arndt further discloses that the metal foil has a thickness of less than 5 μm .

With respect to claim 9, Arndt further discloses that the metal of the foil has an atomic number between 40 and 80 (col.4, lines 25-28).

With respect to claim 11, Arndt further discloses that the outcoupling means is adapted to outcouple X-rays in a direction substantially antiparallel to the direction of incidence of the electrons (Fig.2).

With respect to claim 12, Arndt further discloses that the electrons are directed onto the surface of the metal foil at a substantially 90 degree angle (Fig.2).

With respect to claim 13, Arndt further discloses that the electron source is located outside the X-ray beam (Fig.2) to be outcoupled, and the X-ray source has means for directing the electron beam onto the metal foil (col.3, lines 51-58).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-3, 6 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Whitaker (US 4,622,687) in view of Arndt.

Regarding claim 1, Whitaker discloses an X-ray source (Figs.1, 3 and 15), including:

- a) an electron source 153 for the emission of electrons,
- b) a target 20 for the emission of characteristic, substantially monochromatic X-rays in response to the incidence of the electrons, the target being made of a metal foil 149, 151 having a high atomic number allowing the generation of X-rays 145, and
- c) an outcoupling means (not shown) for outcoupling the X-rays on the side of the metal foil on which the electrons are incident and which is opposite to the side of the base arrangement (Fig.15).

Whitaker does not specifically disclose that the metal foil has a thickness of 10 μm or less, and further that the target has a base arrangement being made of a material having a low atomic number such that X-rays are not generated from the base arrangement.

Arndt specifically teaches the practice of forming a target 4 as a metal foil upon a base arrangement made of carbon (col.6, lines 5-18), where the metal foil is less than 10 μm thick. In this way, the target is more efficiently cooled in order to operate the X-ray source for longer periods of time and/or at higher energies, as needed (col.6, lines 14-18).

It would have been obvious to one of ordinary skill in the art at the time the invention was made for Whitaker to add a base arrangement of carbon and make the metal foil 10 μm or less, as taught by Arndt, in order to greatly increase the cooling efficiency of the target.

With respect to claim 2, the Whitaker/Arndt prior art combination further discloses that the base arrangement is rotatable and includes carbon, a material having an atomic number less than 10.

With respect to claim 3, Whitaker further discloses that the base arrangement has a cooling circuit (Figs.3 and 15) to allow a coolant to flow along the side 43 of the metal foil opposite to the side on which the electrons are incident.

With respect to claim 6, Whitaker further discloses a constriction in the cooling circuit in the area 43 of the metal foil (Fig.3).

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With respect to claim 10, Whitaker further discloses that the outcoupling means is adapted to outcouple X-rays at an angular range from substantially 45 to 135 degrees (Fig.15).

Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Arndt, as applied to claim 1 above, in view of Wilson (US 6,947,522 B2).

Arndt does not specifically disclose that the outcoupled x-rays are approximately 150 to 210 degrees from the incident electrons. However, Arndt does teach that the target may be inclined to the incident electron beam in order to reduce the absorption of emitted x-rays (col.4, lines 28-30).

Wilson specifically teaches an x-ray source arrangement (Fig.4) where the incident electron beam 82 is nearly parallel with the surface 80 of the anode layer 52. In this arrangement, the emitted x-rays 90 (outcoupled through window 34, Fig.1) are within the range of 150 to 180 degrees from the incident electron beam (col.4, line 60 through col.5, line 11). The arrangement provides the ability to control overheating of the anodes (col.2, lines 33-36). It is also readily recognized by the skilled artisan that the inclination will also provide the advantage taught by Arndt, where the absorption of the emitted x-rays, by the target, is greatly reduced in that angular range.

It would have been obvious to one of ordinary skill in the art at the time the invention was made for Arndt to incline the metal foil such that the outcoupling means outcouples x-rays at an angle between 150 and 210 degrees from the incident electron beam, as taught by Wilson, in order to effectively mitigate x-ray absorption by the target, as taught by Arndt, and to effectively mitigate overheating of the target, as taught by Wilson.

Response to Arguments

The present amendments to the claims overcome all 35 USC 112 paragraph 2 rejections.

The present amendment to claim 15 overcomes the 35 USC 102(b) rejection over Day.

New claim 19 has been deemed to be anticipated by Arndt, as outlined above.

New claim 20 has been found to be obvious over Arndt, in view of the newly-cited reference, Wilson.

Applicant's arguments with respect to claims 1, 14 and 15 have been fully considered but they are not persuasive. Applicants argue that the prior art of record does not disclose targets "for the emission of characteristic, substantially monochromatic x-rays in response to the incidence of the electrons" as claimed. The examiner respectfully disagrees.

First, any target that is used for generating x-rays from electron bombardment will emit characteristic x-rays with sufficient electron acceleration voltages. This is a fundamental, inherent characteristic of all materials. Arndt is specific to this fact (col.4, lines 25-28).

Second, no target will provide "substantially monochromatic x-rays" under electron bombardment without the use of filtration of the outcoupled x-ray radiation. Bremsstrahlung and scattered x-ray radiation will always be present.

Third, and most importantly, the prior art of record identically discloses the structure of applicants' invention as claimed. The claim limitation relied upon by Applicants does not impart any structural distinction over the prior art of record, as required in an apparatus claim.

Therefore, given the above observations, the examiner concludes that the prior art of record is capable of providing "characteristic, substantially monochromatic" x-ray radiation, having the structure as claimed.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Dinsmore (US 2006/0233307 A1) teaches x-ray outcoupling means that outcouples x-rays from a thin film target at approximately 135 degrees from the incident electron beam.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

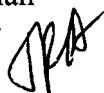
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thomas R. Artman whose telephone number is (571) 272-2485. The examiner can normally be reached on 9am - 5:30pm Monday - Friday.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ed Glick can be reached on (571) 272-2490. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Thomas R. Artman
Patent Examiner



EDWARD J. GLICK
SUPERVISORY PATENT EXAMINER